September, 2020 Volume 44, Issue 9

The LongPath

A North Alabama DX Club Publication

Contents

From the President

I've been looking for evidence of the start of the next solar cycle all year. But mostly what I've seen is sunspots=0. Well, finally the sun is starting to respond. We've had sunspots present on most days over the past couple of months. And even though thunderstorms have dominated our weather over the past two weeks, I've been able to work 15 or more JA stations on a couple of evenings. That's a big change over what we've seen over the past couple of years. The DX is coming back. And now I see the ARRL tells us the solar minimum actually occurred last December. We are finally on our way back up! But we still don't have all the great DXpeditions back yet.

Last month we voted on the final issue of updating our constitution. We are no longer required to remove members upon non-payment of dues (we never did, although the constitution required it). We no longer have to notify members of important happenings by US mail – now we use email. And now we can post most important notifications right on the NADXC website.

The final change was to membership categories. These used to be Honorary and Regular, but we never had any Honorary members. We replaced those categories with Inactive, Regular, and Emeritus. Those members failing to pay dues will revert to Inactive status -- they can't vote but they'll stay on our listings and their DXCC totals will remain. The other membership change is the new Emeritus category, which will effectively replace the Honorary one. Emeritus means just what the dictionary says: a former holder of an office having retired but allowed to retain the former title as an honor. We presently do not have any Emeritus members, just as we never had any Honorary members. I'd like now to change that at our next meeting. I think we should choose Emeritus class members to be our Hall of Fame, our Cooperstown. Do you know some of them? These are the folks who have been with us for many years, and have contributed immensely to who we are, the achievers who have done something eternally memorable. The names that come first to mind are no longer with us, having moved on to SK-land. This is a significant discussion. I'll start it out when we get to New Business.

Time goes on and covid can't stop it. It is time again to appoint an election committee for next year's NADXC club officers. I'll appoint a 2-person committee at our meeting next week. The committee will nominate a slate of officers at the October meeting, and get that announcement into the Long Path. Once the members have had a month to think about it,

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Bletchley Park

September Program by Jim Spikes, N4KH

Allied code breakers and were instrumental in deciphering Wehrmacht and Japanese messages throughout WWII, but beginning as early as the 1920's. Jim tells the story of his visit to the UK and France, with particular emphasis on Bletchley Park. The business meeting beings at 7:00 and the program by 7:30, but Bob will open up the Zoom meeting around 6:30 pm.

How to Join

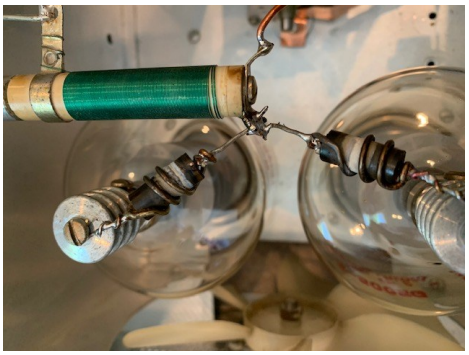
** Come to a club meeting;*

** or send in an application by mail (form on www.NADXC.org)*

Retirement and COVID Project Update 5

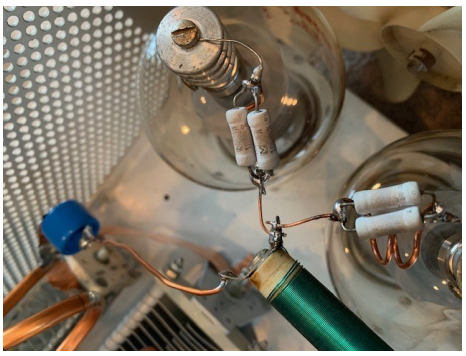
By Steve Werner, AG4W

I continue to update and improve my 6 meter and 2 meter amplifiers. My 6 meter SB-220 amplifier conversion had a burning smell that needed investigating. It turned out the parasitic choke resistors had burned up even with just 2 turn coils as shown below. I did not



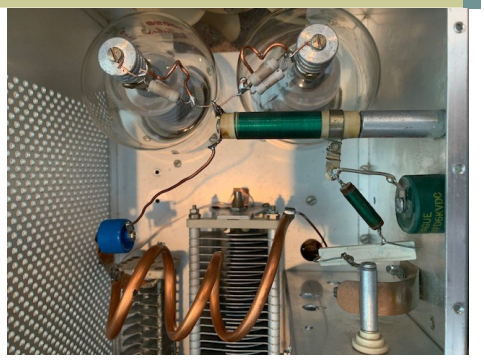
A Burning Smell from the Parasitic Suppressors

follow the advice of a QST article not to wind the 2 turns on the resistor since that is what was done originally with the 3 turn choke in the SB-220. I went down to 2 turns off the coil with two 100 ohm 2 watt resistors instead of one 50 ohm 2 watt resistor (below).



Modification A—Coil not concentric with the resistor(s)

These resistors got hot and started to show some brown spots and power output was reduced. After doing a lot of testing with my NanoVNA and finally having Bob, K8KI test with a very expensive HP analyzer I settled on 1.5 turns with the two 100 ohm 2 watt resistors. The impedance increased nicely with frequency and had acceptable



Modification B—Fewer Turns

loss at 50 MHz. The power was back up to where the resistors had burned open in the original configuration and the amplifier is stable. Like most of my projects there are improvements made along the way.

I now have a switch between my FTDX-101MP and the HF and 6 meter amplifier. It looks like the tuning for

Coax Switches

the 6 meter amplifier is almost set and forget since all my operation is between 50.0 and 50.4 MHz. I have that amplifier offset to the rear of the HF amplifier so it does not effect the HF amplifier cooling. The main thing I didn't like about my SB-220 is it didn't have 160 or 6 meters. It is funny how things sometimes work out. I also made a super heavy duty 240VAC extension cord to plug in my 3 amplifiers ; AL-1200, modified SB-220 and solid state homebrew 2 meter amplifier. I made it out of SO 12 gauge cable which is flexible and rugged and metal electrical boxes. I use only 1 amplifier at a time, but it sure is nice not to have

Amplifier Power Distribution

to plug and unplug them except for lightning which will happen all together. Bob, K8KI could not believe that I still do a lot of my construction on the floor.

What's Wrong with the Floor?

This month I added an EMI filter on the 2 meter amplifier to try to get rid of conducted noise from the power supply. It helped a little, but those 50 volt

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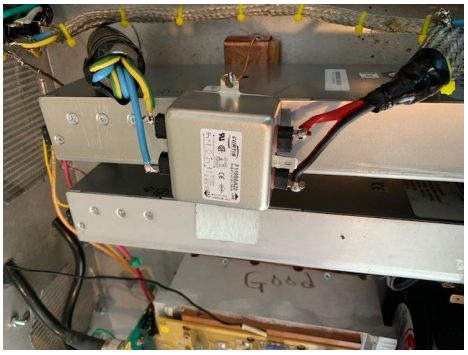
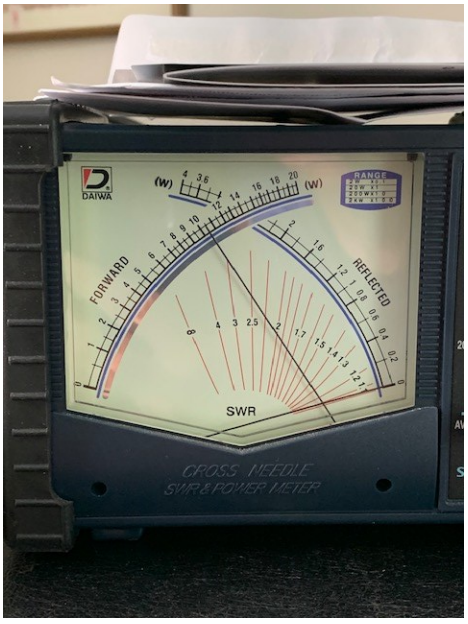
high current switching power supplies sure put out the noise. Right now I shut



Noisy Power Supplies, and Filter

down my amplifier when I am receiving. It sure keeps me busy during EME contacts. I hear the power supply noise mostly when I have the antenna pointed at the house. This month during the good EME days I did push the amplifier harder. Instead of running it at 700 watts I pushed it up to 1000 watts. That is the difference of using 3 vs. 4 watts of drive. One of the stations I



All that with 4W drive

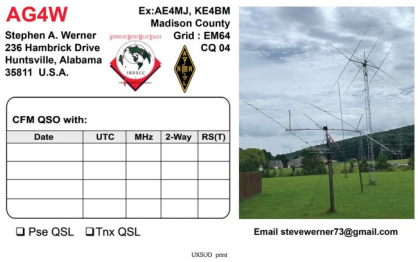
worked was 5B0EME. He had a tough time copying me and gave me a report of -32dB. The higher power made the difference to get the QSO done. Usually -30dB is about the lowest you can decode on JT65B, but he really worked hard to copy me. I worked 20 more first time contacted stations this month to bring my total number of different EME stations worked now to 154. On good propagation days it is amazing what a modest EME station like mine can do. On good days I can work stations with a little less capability than mine. I have even worked a few stations with single yagis and high power.

I am working on adding a way to change the fan speed for the 2 meter amplifier. I saw in an article by John White on SB-220 6 conversions he controlled the speed of an AC fan by adding a choke in series. Bob, K8KI brought over his variac and we determined about 85 volts on the fan would make for a nice additional fan speed. I will wind a toroid to get the right inductance using 24 gauge magnet wire.

This year's E skip on 6 meters has been fantastic. I plan to submit 150 new grid squares for this year bringing me up to 450. I will also apply for my VUCC on 2 meters. I am waiting for 6 QSL confirmations for each of those bands before I can send in for the endorsement and award. I have confirmed 11 new countries so far this year on 2 meters getting me up to 31 and 18 new countries on 6 meters bringing me up to 69. DXCC on 6 meters without an F layer opening is very difficult. Two meters it is even more difficult. I believe I will need at least a 4 yagi array on 2 meters to get DXCC. I sure wish everyone would use LOTW. I just ordered new QSLs from UX5UO. He has great high quality color cards at good prices. His service is great and you pay in Canada. It is hard to believe I have used another 1000 cards with LOTW. So far I have 83,613 QSOs in LOTW with 46,896 QSLs or a 56 percent QSL rate. This QSL percentage has been slowly increasing.

Next month it is the time to make sure all of your antennas are ready for the DX and contest season. It is much easier to do a little preventive maintenance now than try to work on them in January.

I sure have missed the DXpeditions the last 6 months. I expect we will continue to miss the big ones this winter. My flight to American Samoa for the Swain's trip in September was just canceled by the airlines. It is very difficult to get a refund from the airlines. Most are running at a small percentage of their previous capacity and loosing big money. Many of the hams like myself that planned to go on DXpeditions have lost money due to deposits that are not refundable and travel. It has been sad to see the large number of DXpeditions that got cancelled. Back in February I thought I was going to be the only one effected by COVID when we delayed our Swains's DXpedition from March to September. That sure did change. Our Swain's team is still committed to going there, but I expect we will all be a little cautious before committing to a new date.



Reverse Beacon Network—More on What It Is

By Bruce Smith, AC4G

In last month's North Alabama DX Club (NADXC) LongPath, Mark Morgida (AA2MA) touched on the reverse beacon network (RBN). I wanted to dig a little deeper into the RBN and discuss how it came about, describe the configuration, and how I have recently used the RBN to my advantage especially since I had begun writing this article and had it almost completed.

Have you ever used the reverse beacon network? Many times I have read or heard about other radio amateurs casually mentioning RBN in their discussions on the air or as a casual listener picking up bits of information at a ham club meeting or on the air receiving a one or two sided DX discussion, but I really did not know it ability for ham operators. In this article, I hope to add some useful information to each of our knowledge bases that will benefit each of us whether we are serious DX'ers and contesters, or just casual hams picking up a DXCC country here and there or working a ham radio contest for the fun of it. Hopefully you can add another tool to your DX/Contesting arsenal after reading this article.

So what is the RBN and why should I care as an amateur radio operator? Is this a new idea or has this been around for a while?

RBN is a network of stations called skimmers listening to the amateur HF bands decoding CW and reporting signal reports for stations heard on the amateur bands and how well they receive them. The skimmers are based on specific stations, setup for this purpose by ham operators. Hams have devised a method or system to report this information to other ham operators. Does this sound like a series of beacons?

Typically, beacons serve to indicate band conditions through the signal strength received from many different parts of the world. Beacons are automatic stations transmitting on fixed frequencies in Morse code or CW. By listening to these beacons, one can be informed of current band conditions. Reference the NCDXF Beacon Network that operates worldwide. RBN works in a different way.

RBN consists of a number of automatic receiving stations monitoring and decoding CW on several bands. Intelligent software has the ability to decode call signs, measure signal strength, and filter received data. This allows for conclusive band condition truth. As mentioned earlier, these automatic receivers are called skimmers. Ham operators can "trigger" the RBN by transmitting a "CQ" and sending their call sign. Looking on the RBN web site will show your call sign and signal strength. My recommended method to trigger the RBN is by sending: "CQ TEST CQ DX DE AC4G CQDX DE AC4G K". Picture 1 illustrates the RBN capability.

At the current time, Google has increased its price for its mapping services and broke the RBN website relating to mapping. Google has announced a whopping price jump to use their map service which is cost-prohibitive; therefore, RBN designers have begun searching for other open source solutions for mapping. Thankfully, The RBN designers now have an open source mapping tool for hams like you and I to use and do not rely on Google and other large companies.

So how did RBN come about? There was software developed by VE3NEA as a DXing tool permitting the efficient monitoring of CW pile-ups called "CW Skimmer" released in early 2008. This software allowed CW signals to be decoded. Contesters immediately saw "CW Skimmer" as a tool to increase their contest scores. Then there was much discussion whether contesters could use this tool and if the rules would allow skimmers. After telnet capability was added to feed spots directly to contest logging software, the de-

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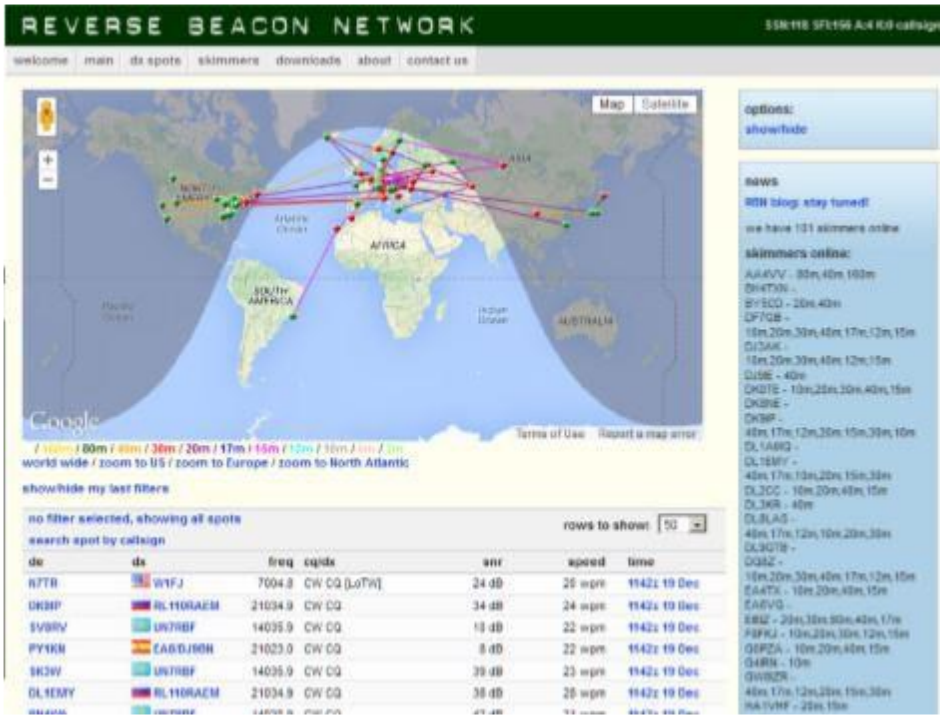
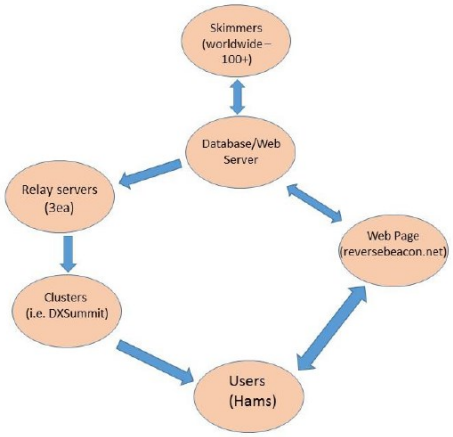


Picture 1—This is the RBN

bate took over the Contest Reflector discussions.

In March 2008, PY1NB came up with the RBN idea and worked with VE3NEA to define and test "CW Skimmer" for RBN. This RBN system was configured in about 2008 after the CW Skimmer software was released. PY1NB developed aggregator software to receive spots from skimmers telnet servers and transmit them to PY1NB's DX Web site DXWATCH.com. Finally in 2010, F5VIH/SV3SJ used his computer background and knowledge to roll out a signal analysis tool to compare signals of multiple stations on multiple bands; hence was born RBN. In 2011, W3OA produced the first Windows aggregator. In 2013, RBN delivered nearly 100 million spots. In 2013, the Chinese added three (3) sites, while YASME funded a site in India. KM3T is a server programmer/system designer/supports Linux relay server. Reference Picture 2 showing how RBN works.



Picture 2—How RBN Works

As a user of RBN, the concept of operation is simple. Each ham connects to the RBN via the internet URL www.reversebeacon.net to view data. The skimmers (worldwide) are continuously receiving signals and sending the information to the RBN database where data is stored from ham radio operators operating on the ham bands. From there, data is sent to relay servers where data is distributed to various DX Clusters connected to the system for user viewing. Data is also sent from the RBN database to the RBN Web page where users can view parsed data and/or perform data management functions. Users can also filter data and compare station signals. The data consist of callsign of the station operating, frequency, date/time, signal report, to name a few data parameters collected.

But why do I care? To begin with, as a DX'er or contester, this system allow us to realize in near-real time when bands are opening to a certain area of the world. This system provides a visual map of stations heard and their signal strength. But the interesting part is the database of past DX cluster "spots". As hams, we can instantly find out when ham stations from a given DXCC country or CQ Zone have been heard, if there are established operating periods, and on what particular bands or frequencies. You know what else? You can see when you have been spotted, who spotted you, and how loud you were received by the distant station.

This is not all! You can also compare your signal with the signal of your competitors or nearby ham buddies in near-real time. How cool is that? Yes, the system has a Signal Comparison Tool that can tell you how well your signal propagated to other areas of the globe and provide you with real quantitative data whether it be from a contest or casual DXing. It allows us to compare different signals from various ham stations from a specific beacon on a certain band at a certain time. For comparison, both stations have to transmit at the same time using the same power. This can be best achieved in a contest.

We can compare our station signal data with others via the internet by selecting a date, a reverse beacon station, and call signs to compare. The tool will produce graphs showing comparative results for up to 10 stations at a given location, over time. Reference Picture 3 for station comparative results and details. Picture 3 also shows station SNR of four stations. We would actually need to zoom-in to see the fine

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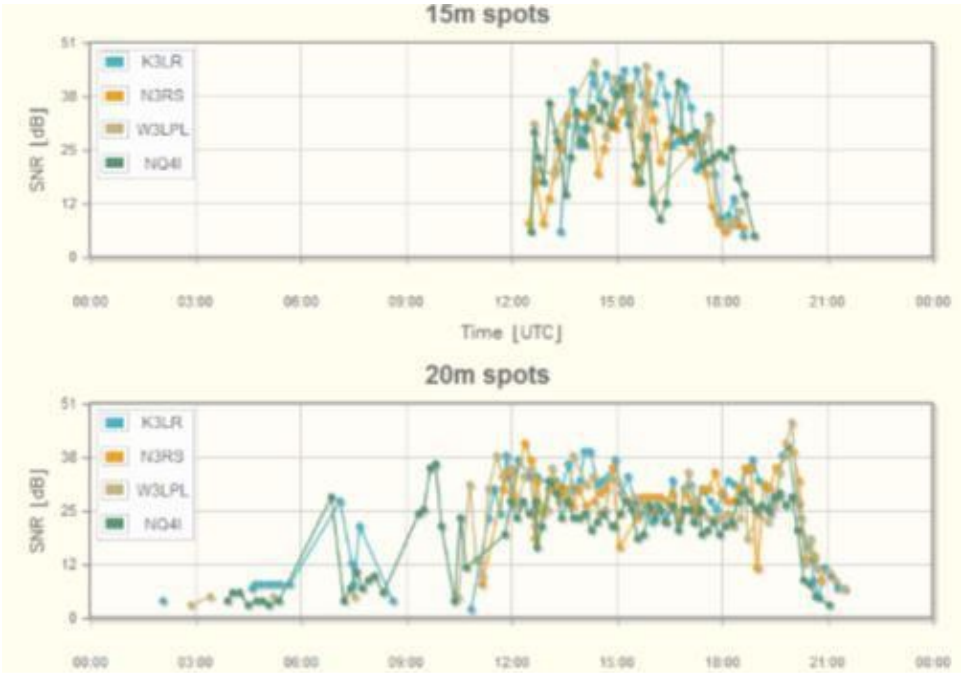
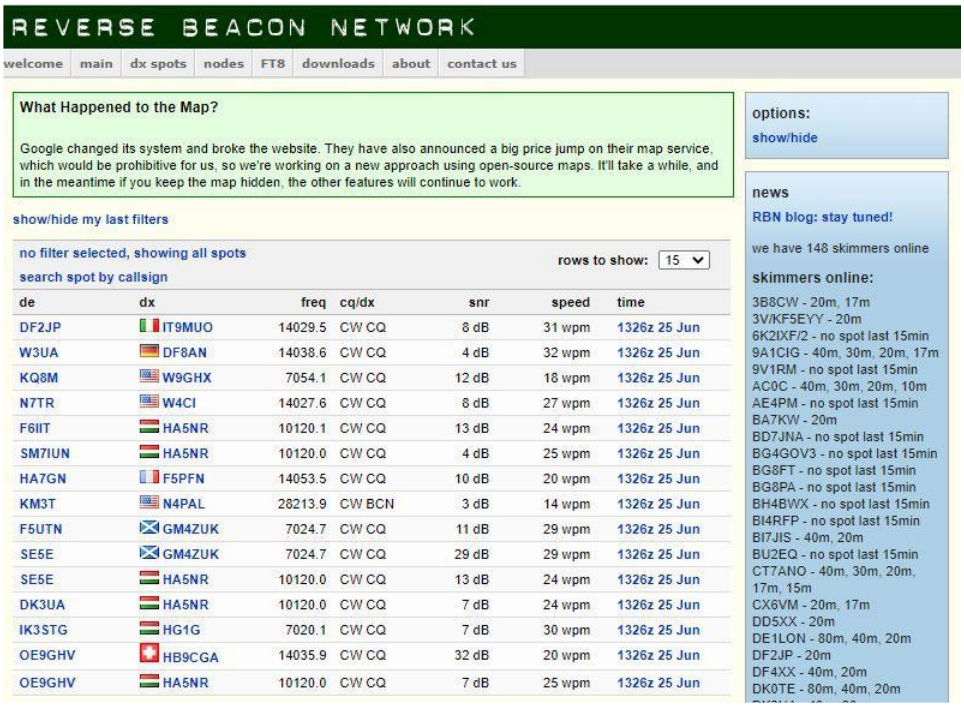


Picture 3—Station SNR Comparisons

details using the built-in analysis tool.

Picture 4 shows the callsigns of many stations and their pertinent data parameters to give every ham operator a picture of who has been operating on the bands and the time frame.

Just think of how you can use RBN to improve the efficiency of your transmitted signal and antennas. Have you ever wonder whether your signal is "getting out" or who can hear your signal while calling CQ? This system will allow you to make modifications to your antenna, change antennas, or make other mods to improve your transmitted signal. Picture 5 illustrates how AC4G sent CQs and how Skimmer receiving stations received my signal. I was testing my 80m vertical and 30m dipole for function since resurrecting my new ham shack. It happens that many U.S.A. stations heard my CQs via CW on 23 June 2020.



REVERSE BEACON NETWORK

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What Happened to the Map?

Google changed its system and broke the website. They have also announced a big price jump on their map service, which would be prohibitive for us, so we're working on a new approach using open-source maps. It'll take a while, and in the meantime if you keep the map hidden, the other features will continue to work.

show/hide my last filters

no filter selected, showing all spots
search spot by callsign

rows to show: 15

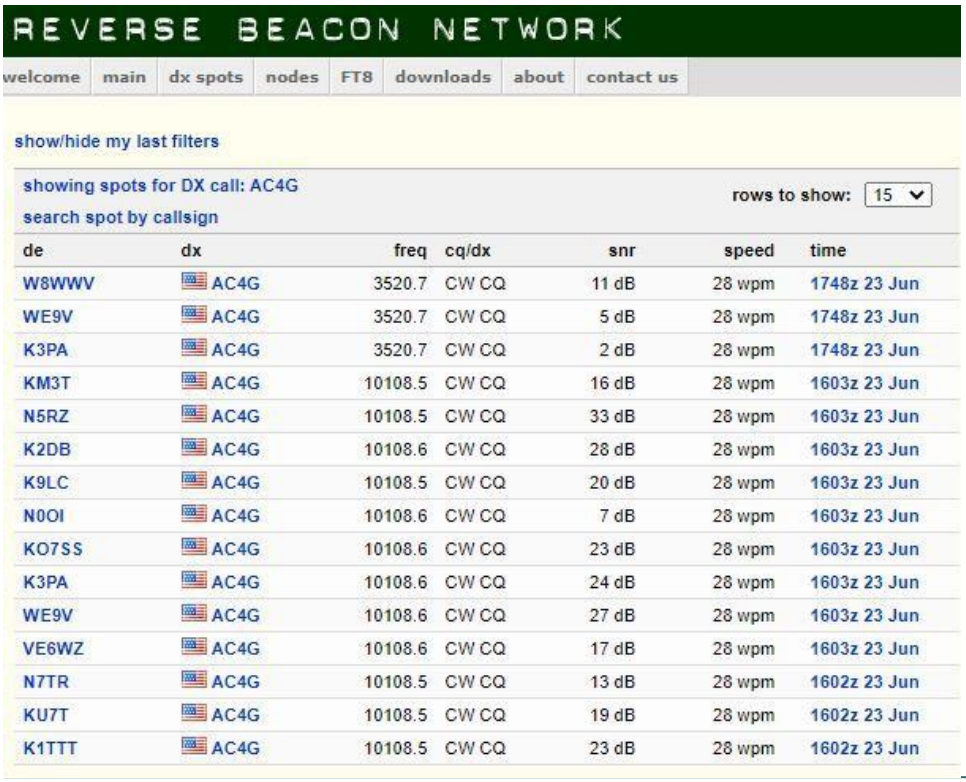
de	dx	freq	cq/dx	snr	speed	time
DF2JP	IT9MUO	14029.5	CW CQ	8 dB	31 wpm	1326z 25 Jun
W3UA	DF8AN	14038.6	CW CQ	4 dB	32 wpm	1326z 25 Jun
KQ8M	W9GHX	7054.1	CW CQ	12 dB	18 wpm	1326z 25 Jun
N7TR	W4CI	14027.6	CW CQ	6 dB	27 wpm	1326z 25 Jun
F6IIT	HA5NR	10120.1	CW CQ	13 dB	24 wpm	1326z 25 Jun
SM7IUN	HA5NR	10120.0	CW CQ	4 dB	25 wpm	1326z 25 Jun
HA7GN	F5PFN	14053.5	CW CQ	10 dB	20 wpm	1326z 25 Jun
KM3T	N4PAL	28213.9	CW BCN	3 dB	14 wpm	1326z 25 Jun
F5UTN	GM4ZUK	7024.7	CW CQ	11 dB	29 wpm	1326z 25 Jun
SE5E	GM4ZUK	7024.7	CW CQ	29 dB	29 wpm	1326z 25 Jun
SE5E	HA5NR	10120.0	CW CQ	13 dB	24 wpm	1326z 25 Jun
DK3UA	HA5NR	10120.0	CW CQ	7 dB	24 wpm	1326z 25 Jun
IK3STG	HG1G	7020.1	CW CQ	7 dB	30 wpm	1326z 25 Jun
OE9GHV	HB9CGA	14035.9	CW CQ	32 dB	20 wpm	1326z 25 Jun
OE9GHV	HA5NR	10120.0	CW CQ	7 dB	25 wpm	1326z 25 Jun

options:
show/hide

news
RBN blog: stay tuned!
we have 148 skimmers online

skimmers online:
3B8CW - 20m, 17m
3V/KF5EYY - 20m
6K2IXF/2 - no spot last 15min
9A1CIG - 40m, 30m, 20m, 17m
9V1RM - no spot last 15min
AC0C - 40m, 30m, 20m, 10m
AE4PM - no spot last 15min
BA7KW - 20m
BD7JNA - no spot last 15min
BG4GOV3 - no spot last 15min
BG8FT - no spot last 15min
BG8PA - no spot last 15min
BH4BWX - no spot last 15min
BI4RFP - no spot last 15min
BI7JIS - 40m, 20m
BU2EQ - no spot last 15min
CT7ANO - 40m, 30m, 20m, 17m, 15m
CX6VM - 20m, 17m
DD5XX - 20m
DE1LON - 80m, 40m, 20m
DF2JP - 20m
DF4XX - 40m, 20m
DK0TE - 80m, 40m, 20m

Above—Picture 4: Signals Received by AC4G on 25 JUN 2020
Below—Picture 5: AC4G Signals Received by RBN Stations



REVERSE BEACON NETWORK

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show/hide my last filters

showing spots for DX call: AC4G
search spot by callsign

rows to show: 15

de	dx	freq	cq/dx	snr	speed	time
W8WWV	AC4G	3520.7	CW CQ	11 dB	28 wpm	1748z 23 Jun
WE9V	AC4G	3520.7	CW CQ	5 dB	28 wpm	1748z 23 Jun
K3PA	AC4G	3520.7	CW CQ	2 dB	28 wpm	1748z 23 Jun
KM3T	AC4G	10108.5	CW CQ	16 dB	28 wpm	1603z 23 Jun
N5RZ	AC4G	10108.5	CW CQ	33 dB	28 wpm	1603z 23 Jun
K2DB	AC4G	10108.6	CW CQ	28 dB	28 wpm	1603z 23 Jun
K9LC	AC4G	10108.5	CW CQ	20 dB	28 wpm	1603z 23 Jun
N0OI	AC4G	10108.6	CW CQ	7 dB	28 wpm	1603z 23 Jun
KO7SS	AC4G	10108.6	CW CQ	23 dB	28 wpm	1603z 23 Jun
K3PA	AC4G	10108.6	CW CQ	24 dB	28 wpm	1603z 23 Jun
WE9V	AC4G	10108.6	CW CQ	27 dB	28 wpm	1603z 23 Jun
VE6WZ	AC4G	10108.6	CW CQ	17 dB	28 wpm	1603z 23 Jun
N7TR	AC4G	10108.5	CW CQ	13 dB	28 wpm	1602z 23 Jun
KU7T	AC4G	10108.5	CW CQ	19 dB	28 wpm	1602z 23 Jun
K1TTT	AC4G	10108.5	CW CQ	23 dB	28 wpm	1602z 23 Jun

If you want to A/B test two different antennas or want to see how your amplifier boosts your signal, you can. Skimmers typically pick up your callsign once on a given frequency within a given time period. In order to do A/B testing by finding two clear frequencies a few kHz apart and send several "CQ's" on one frequency using antenna A and QSY to a second clear frequency and send "CQ's" with the other antenna. Afterwards, check RBN website with a filter set for your call sign and compare the reported signal for frequency A versus frequency B.

RBN also is a near-real time tester of propagation. Ever check the solar indices to find good flux and A/K levels, but never hearing anyone on the bands? RBN will allow you to see the DX on the bands. Use RBN spots to & from an area you define to characterize propagation in near real time. If you want to know when you have the best conditions to Australia, then we do the following:

Create your filter; Select "VK-Australia"; Select your country and set the point to this line; select "Band" and "Proceed"; follow a list of stations where you find the signal strength/band/time. Note: all countries do not have skimmers.

The RBN is made up of 100's of volunteer stations that are active 24/7, with a few stations operational occasionally

Cont'd on p. 7

when hams power up their stations. Coverage in North America and Europe is decent. The system can always use more stations to help with this endeavor, but need not tie up your equipment. Picture 6 shows part of a list of Skimmers online who are dedicated to RBN.

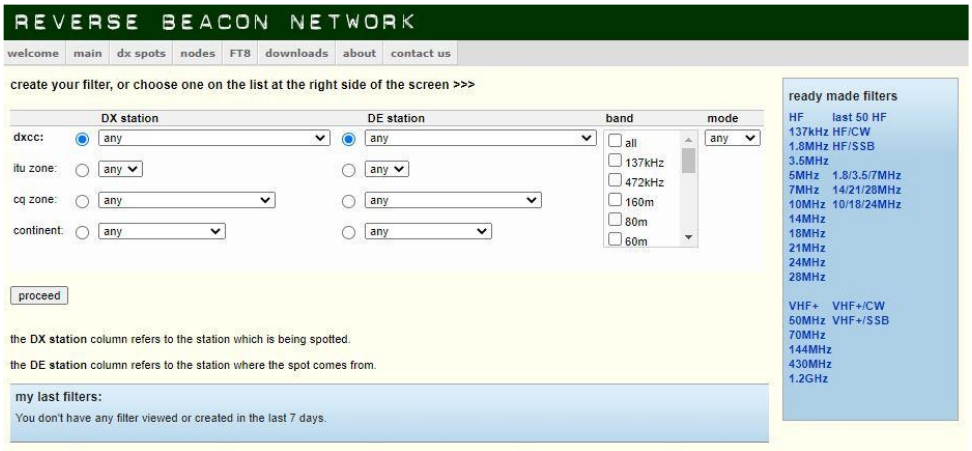
Picture 6—Some RBN Skimmer Stations

To become part of the RBN system is very easy. You can become a reverse beacon "Skimmer" by simply downloading the aggregator software from the RBN software download site and extracting the aggregator into the Skimmer program directory. Next, you would put a link to the aggregator on your PC desktop and setup the Skimmer. Afterwards, click the link to run the aggregator and minimize the aggregator to keep it running. It will not interfere with anything you do like adding spots to a spotting cluster. But not everyone wants to be a Skimmer. Many hams will just want to use this system.

What else does RBN allow? If you bring up the URL website at www.reversebeacon.net, you will see call signs of stations received by specific RBN stations, the frequency spotted, whether it is a CW CQ, the signal-to-noise (SNR) in decibels (dB), their CW speed and time/date the station was heard. The system allows one to apply filters or see all (Reference Picture 7). The filters allows one to set any DX station or a specific DX station. It will allow you to set which ITU zone or CQ Zone and from which continent.

pability to hams worldwide.

In summary, RBN has been intriguing enough for me to try and perhaps for you to put another tool in your DXing and contesting endeavors. By now you have probably realized that RBN uses CW to activate the system. Do you have to know CW to use the system? Perhaps not, but in order to use the system functions, one must send CW as described earlier. This may be the thing that encourages the non-CW operator to learn Morse code. But be advised, one does not have to know Morse code to use the function, but must utilize CW to measure your signal strength. RBN now also include FT4/FT8 signal reception with the capabilities describe earlier. RBN has helped me to compare my antennas and determine which is best under certain conditions. Good luck with RBN and let us know how it works for you.



Picture 7: RBN Filter Setting Page

Recently, The Yasme Foundation has announced a supporting grant to establish Reverse Beacon Network (RBN) nodes in Algeria, Tunisia, and Libya. The project will be carried out by youth members of Amateurs Radio Algerians and the Association des Radio Amateurs Tunisian radio clubs. These nodes will increase RBN presence in Africa for both the amateur and scientific communities and provide RBN ca-

What's the MUF and Why Should You Care?

By Rob Suggs, NN4NT

The Maximum Usable Frequency or MUF is highest radio frequency that can be used for transmission between two points via ionospheric refraction. It depends on ionospheric density which depends on time, location and solar activity and is independent of transmitter power. If your signal is above the MUF it travels into space, if below the MUF it can be refracted back to Earth, hopefully on top of the DX you would like to work.

The MUF also depends on the angle of incidence of your signal relative to the ionosphere. The detailed geometry for a given path is a little messy because the Earth isn't flat (really, it's not) but if you can remember that the low radiation angle we like for DX contacts has an elevation angle E close to zero and near-vertical incidence skywave (NVIS) needed for regional communications is close to E of 90 degrees, then you can see that

MUF = critical frequency / sin E

gives a MUF near the critical frequency for NVIS (sin 90 = 1) while for low angles, like 5 degrees the MUF is much higher, approaching infinity (division by 0) for E = 0. That isn't physically possible and the math breaks down because the isn't flat, etc. but you get the general idea.

So, what is this critical frequency and how is that obtained? It is the frequency below which the RF signal from a vertical sounder is returned to the transmitter (E = 90 degrees). These sounders, called ionosondes, are located around the world and they are constantly "pinging" the ionosphere to measure its characteristics. You hear some related instruments squeak across your passband, and see them sweep across your panadapter display frequently on HF. The symbol for critical frequency is foF2, that is the frequency at which the *ordinary wave* (did you hear my propagation talk at HARC a few weeks ago?) is returned back to the transmitter from the F layer. Check Wikipedia for ionosondes if you'd like to know more. You can find maps of foF2 at

http://www.sws.bom.gov.au/HF_Systems/6/5

Figure 1 below is an example. You can clearly see that the critical frequency is higher during the day near the magnetic equator which is kinked down over South America. The kink is because the Earth's magnetic field is tilted and offset from the center of the Earth (which isn't flat).

The ionosonde measurements are filled in by ionospheric models to give the full map. Note that your path to a DX station crosses parts of the ionosphere with different MUFs making accurate propagation prediction a matter of raytracing along a complex path. There are tools to do that but approximations are available in propagation programs like VOACAP.

We should also discuss the LUF, which is the Lowest Usable Frequency. LUF is driven by D layer absorption which is proportional to $1/freq^2$ so is strongest on the lower bands such as 160 and 80m. The D layer is created by solar X-ray radiation. When the sun goes down the X-rays move on to the other side of the Earth, the D-layer free electrons and ions happily recombine in their electrostatic embrace, the D-layer diminishes, and 80 and 160 open up. A solar flare generates a lot of X-rays which knocks those electrons off their atoms, enhances the D-layer and can wipe out propagation even on the higher bands in the daylight hemisphere. Figure 2 is an example of this which occurred in September 2017. The red blob over the daylight hemisphere indicates that frequencies up to 35 MHz

Cont'd on p. 9

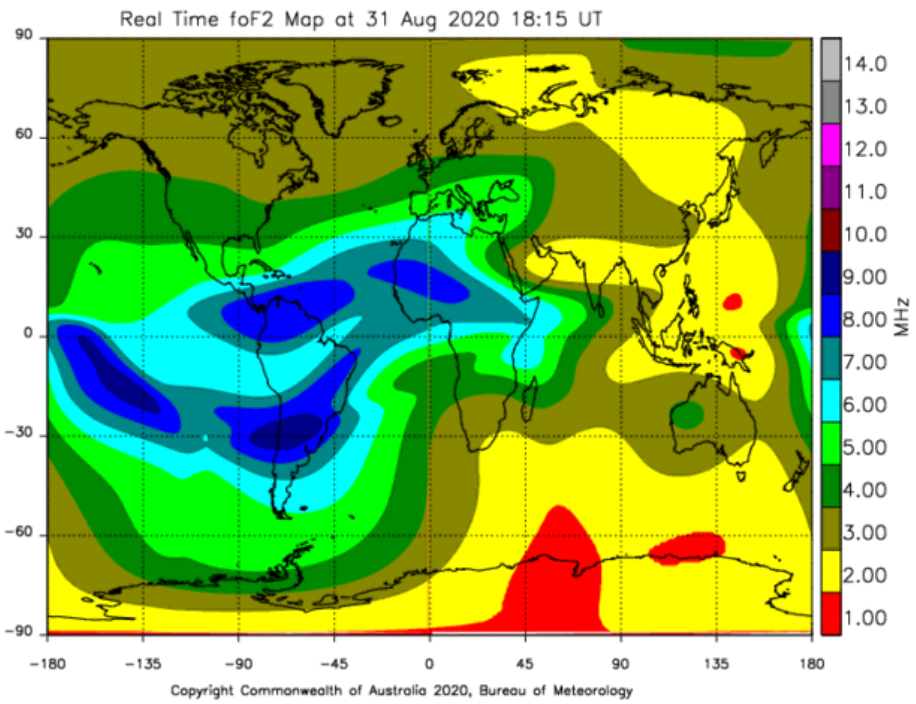


Figure 1—Map of critical frequency, foF2, on 31 August at 1 pm CDT

What's the MUF and Why Should You Care?

(cont'd from p. 8)

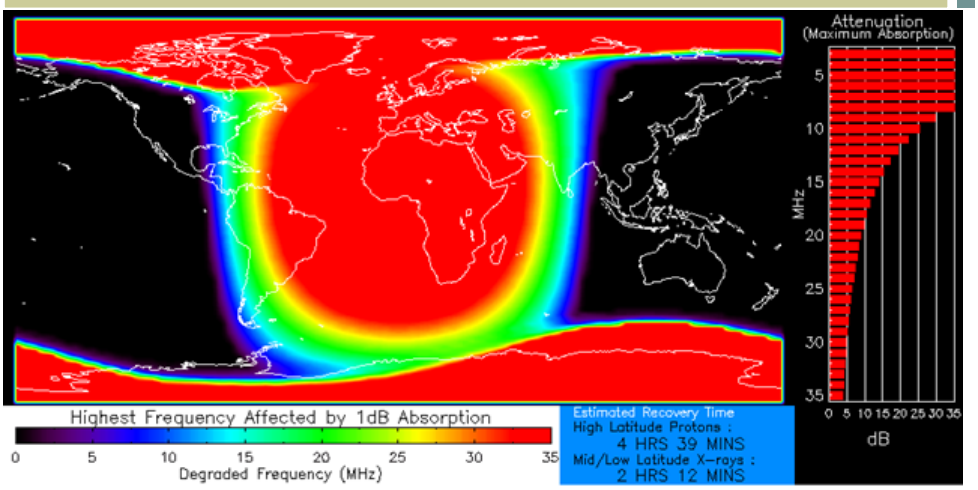


Figure 2 – D-layer absorption from Sept. 2017 solar X-ray flare

had at least 1 dB of D-layer absorption. The histogram on the right of the plot shows around 15 dB absorption at 20m and 25 dB at 30m. That's about 2.5 and 4 S-units, respectively. You can forget 40m and below which have over 35 dB of absorption. The red bands at high latitudes are polar cap absorption from solar energetic protons which is a different but related effect of the solar event.

So, if you can keep your rig tuned to bands between the MUF and the LUF you can have some HF fun. As solar cycle 25 begins to come to life, the extreme ultraviolet radiation from the sun will increase F layer electron density which makes the foF2 critical frequency (and the MUF) increase. The cruel irony is that with increased solar activity there is an increased chance of X-ray flares which drive the LUF upward and sometimes totally clobbers the HF bands. Fortunately, those events are not too common and are relatively short-lived (a few hours). This allows us to enjoy HF operating on higher bands as we follow the solar cycle and the MUF upward.

73 and gud dx

Rob

NN4NT

From the President

(cont'd from p. 1)

we'll vote in November, and announce the results at the December meeting. I wonder if it might be possible to meet safety requirements at an in-person meeting? I don't really think so yet, but we can certainly discuss it on Tuesday.

On a recent trip to England, Jim Spikes, N4KH, took the opportunity to visit Bletchley Park, where British code breakers were able to decode messages from German U-Boats in World War II. That was DX of a different kind. But how did they listen to those submarines? What kind of radio equipment did they have? How did it compare to ours today? What frequencies did they use? Come listen to Jim at our next meeting, Tuesday September 8 at 7pm. I'll start the Zoom meeting a half hour earlier, at 6:30pm. We will not use the 2m repeater, unless someone would prefer that we do.

NADXC Officers and Directors

President	**Bob De Pierre, K8KI**
Vice President	**Steve Molo, KI4KWR**
Secretary/ Treasurer	**Chris Reed, AI4U**
At-large	**Kevin Hibbs, KG4TEI**
Directors	**Tom Duncan, KG4CUY**
(Ex-Officio)	**Steve Werner, AG4W**

Treasurer's Report

By Chris Reed, AI4U

August 31 Balance	8394.68
Paypal Balance	154.45

New applicants for membership paid via Paypal

NADXC Finishers in CQ WPX SSB Contest

As printed in CQ Magazine and reported by Bruce Smith, AC4G, we have the following notable finishes in the most recent WPX SSB contest:

AG4W	7 MHz SSB high power Second place
AB4B	3.7mhz SSB high power Third place
AC4G	7mhz SSB Low Power Second place

Congratulations!

Infrared and RF Remote Control Links

By Tom Duncan, KG4CUY

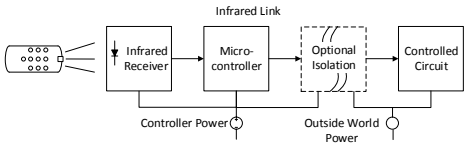
Every so often I run into something that needs to be remotely controlled. The chicken-and-egg process of stumbling around in the dark to find a light switch so you can turn on a light and avoid stumbling around in the dark is an example, and there are many others. Many remote controls are touted as making whatever-it-is-they-control more convenient to use, but the motivation is likely as not reducing the cost to produce the item. I recently replaced a 4-position (off + 3 speeds) ceiling fan pull switch to the tune of about $ 14 at Lewter's, but I did get a few peanuts in the bargain and petted the cat. I doubt the cost to replace that switch with a tiny infrared receiver and a one-button remote is $ 14, in a mass-production environment.

Infrared remote controls have been around long enough and are so widespread that the life of the controlled appliance – a TV, a ceiling fan, a VHS tape player – expires or is obsoleted by new and therefore better technology before the demise of the remote. Somehow the remote itself, sensing the imminent departure of the controlee, hides in one of those drawers you never open. Years later it is found, complete with leaky batteries, which are removed, and it goes back into the drawer. I have a collection of these, and I suspect that unless you have the enviable fortitude to be prepared to throw away a possibly perfectly operable remote, you do too. An old remote is one end of remote control link you may find useful in the shack or elsewhere around the house or garage.

Infrared remote-control technology is under attack by RF. Once-ubiquitous infrared "page flipper" remotes for your computer are becoming hard to find, replaced by RF versions with more buttons. The RF versions do indeed support longer link distances, and are somewhat less picky about the receiver location. Garage door and car remotes are similar distance-wise and in terms of the number of supported functions. A left-over RF remote has much less potential as part of a new, custom-built remote control link than the good old infrared remote, because it's vastly more complicated and inscrutable. There are only so many infrared protocols, a little rooting around on the web will turn them up, and the nature of operation is simplex "push a button, receive a button code." So don't lose any sleep about pitching that old 27 MHz RF remote keyboard and mouse.

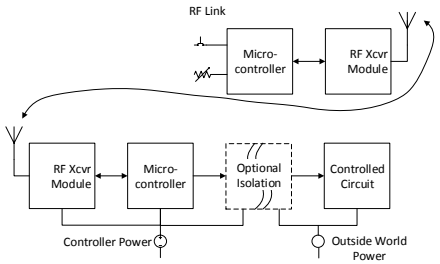
We have two effective and accessible technologies at our disposal. Before looking at implementation details, let's think about remote control projects. The "Hello World" of these is the remote-controlled power outlet, something you might use every day or once in a blue moon, but it sure is nice to have when you need it. A slight variant of this is several channels of two-state outputs, say relay contacts. I recently wanted to rotate my antennas while standing at the tower base. A three-pushbutton remote control and some clip leads temporarily attached inside the rotor control box did the trick – no running back and forth. Some things are more continuous in nature – a light dimmer, or a volume control – and there are tricks to handle these needs.

A typical infrared remote control link looks like this:



The microcontroller performs whatever is necessary to turn the infrared receiver output into control signals for the controlled circuit. The optional isolation box keeps you, the controller circuit, and the controlled circuit out of danger: for a great many purposes isolation will be provided by a relay, a transistor-output opto-isolator, or a triac-output opto-isolator. The link is decidedly uni-directional: the control action originates in the repurposed remote control, is sensed and demodulated by the infrared receiver (generally in an unassuming TO-92 case), and ultimately does something to the controlled circuit.

A typical RF remote control link could look like this:



Certainly there is a lot more to it, but there's also duplication. "RF Transceiver Module" and "Microcontroller" will be part of a PC board which might contain isolation circuity left un-populated or at least unused on the controlling side of the link, just as the actuating pushbutton and pot (don't take these too literally, they're just typical kinds of inputs) are unused on the controlled side. In some cases the firmware may be identical, with jumper configuration. Unlike the infrared case, we see two-headed arrows between the RF transceiver module and the microcontroller. Transceivers allow us to verify the requested control operation really took place, or at least was successfully received and then acknowledged by the controlled side. This is a tremendous improvement over the infrared implementation.

Cont'd on p. 11

Infrared and RF Remote Control Links

(cont'd from p. 10)

A simple infrared link I use every day has four control circuits: three are relays turning 120VAC power on and off, and the fourth is a 120VAC light dimmer. The infrared receiver demodulates the 38 kHz "carrier" produced by the remote (a Panasonic-format one from a dead DVD player) and outputs a series of ones and zeros corresponding to the key code. There's a button to turn each relay on, and another one to turn each one off. Two other buttons are used to increase and decrease the dimmer conduction angle. Because there were so many buttons left, there are also "full-on" and "full-off" buttons for the dimmer, and a "master off" button. Relays provide safety isolation for the first three circuits, and a photo-triac is used for the dimmer, providing isolation there. There's another transistor-output optical isolator used to determine zero crossings on the incoming 120VAC power so triac switching is not glaringly obvious.

An RF link recently put together is used to drive camera tally lights for a friend's church where Sunday services are pre-recorded. There are three wired cameras with tally lights, and one wireless one that needs a tally light. The camera operator sees two lights: preview (yellow) and program (red), but the talent sees only program. Relay contacts driven by the switcher software close when the associated light is on. The wireless camera remote control link consists of the transceiver module and a microcontroller – the tally lights are LEDs driven by MOSFET hanging off two digital outputs, no sort of isolation is required. A change in contact state causes the control side to send a command indicating the desired state of the lights. The controlled side receives this, sets the lights accordingly, and sends an acknowledgement back along with the original command. If the control side sees an ACK and the command matches what it just sent, it lights up the corresponding light on the control side. Anything else – no ACK, or a command mismatch – causes both lights to come on at the control end, indicating a failure. A successful send clears the indication. All this back-and-forth is made possible by the bidirectional nature of the link. The hardware and firmware are identical at the control and controlled ends.

Let's take a look at some of the differences between infrared and RF links. While both are nominally line-of-sight (we're generally talking 800 MHz and up for RF links), infrared is more strictly line-of-sight than RF. Even so, light bounces off light-colored walls very nicely as I'm sure your TV remote has shown. The range of RF is far greater – using PC-board-trace antennas built in to transceiver modules, 400 feet is easily achievable even when the path isn't quite perfect line-of-sight, at 10 mW or so transmit power. 30 feet is about it for infrared in the presence of other light sources. If you need to send anything other than button codes, go for RF. Data rates are ridiculously slow (several characters per second is blazingly fast) for infrared, while RF links typically support several 100k bits/second.

The bidirectional nature of the RF link afforded by transceiver modules is another advantage over infrared, but for those of you who are adventurous, you can put together a bidirectional infrared link. I did this for a code practice module. The 2.6" x 1.4" PC board, powered by 3 "AA" cells, has an infrared receiver and an infrared LED, both in TO-92 packages. An 8-pin microcontroller is sufficient to read the receiver, drive the transmitter, read the key input, and drive a tiny speaker. One of these will talk to another one – hardware and firmware are identical at both ends – so two operators can QSO on the 940 nanometer infrared band. In theory, three or four such modules support a round-table net, but in practice it's bedlam.

Just a bit about parts. "Infrared Receiver" is a three-terminal device powered by 2.5-to-5.5-or-so VDC and outputs a bit stream. The Vishay TSOP-32338 is an example. "RF Transceiver Module" is a transceiver chip and important passive components like tank and impedance matching circuits on a very small PC board, suitable for mounting over a ground plane on another PC board—the one you'll need to supply. It is a complete sophisticated data radio with a built-in antenna, suitable for unlicensed operation in one of the ISM bands. The Microchip MRF89XAM9A is an example. "Microcontroller" may be a single microcontroller chip, or something bigger like an Arduino.

If you need a remote control link, it is indeed possible to make one. The PC board will likely be the most expensive part – next are RF transceiver modules at about $ 8 each. Don't overlook simple infrared links for short distance indoor use. Give an old remote a new sense of purpose.

The LongPath Staff

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Chris Reed, AI4U, Minutes

Bob De Pierre, K8KI, From the President

Steve Molo, KI4KWR, VP Corner

Kevin Hibbs, KG4TEI, The Casual DXer

Geography for DXers

By Bob DePierre, K8KI

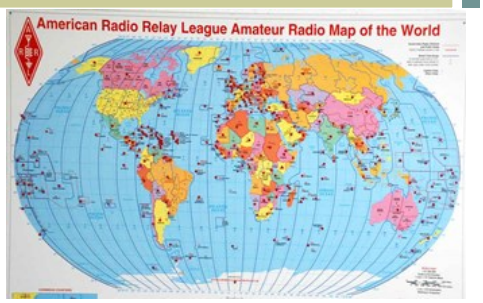
Did you know that DXers are among the best geographers around? We spend a lot of time, not just looking at maps and memorizing them, but have a better appreciation for the people who live there. While I was in the USAF, I had 3 assignments outside the country (total of 6 years) and met a lot of folks whose background was nowhere close to mine. So I am very interested in learning about the many countries, and at least the Long Path bearing to them. And I have maps that I use to turn my antennas to the proper bearing. So where does a DXer go to find ham maps?

Well, you can let Google do the searching for you, and there are many results. Many of the available maps are free downloads, and most of those are in .jpg or .pdf formats.

You can also find interactive maps. Those will adapt to show listings of call signs so you can locate your target. They'll show light/dark areas as well as gray lines. They'll show Mercator or Great Circle projections as you need, and show your location in the center. They'll sync with your computer clock, as well as a host of additional features.

Great Circle centered on N4EGA's QTH

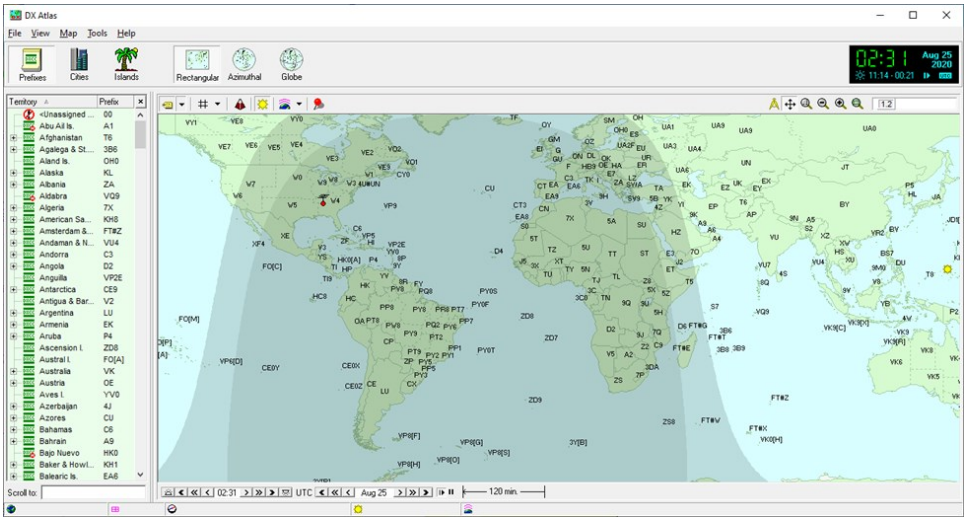
You can find a wide variety of maps from well known publishers such as ARRL, CQ, or Buckmaster. Those are available laminated and strong enough to mount on the wall.



Above: ARRL Robinson Projection Map
Below: CQ Zones

Great Circle/Azimuthal and Maidenhead grid zone maps are widely available and extremely useful. Some Great Circle maps are fixed center while others can be centered on your location. If you are trying to work IOTA entities, you can find those as well.

Maidenhead Grid Map



DXAtlas showing daylight, dark, and adjustable-width gray-line regions

Buckmaster is an old name in ham radio. They publish callbooks, now on CD or online, as well as a series of maps. I have an 8x10 laminated Great Circle map, which is centered on my QTH. It's too easy to keep in front of my eyes while I'm trying to rotate my antennas toward the target DX.

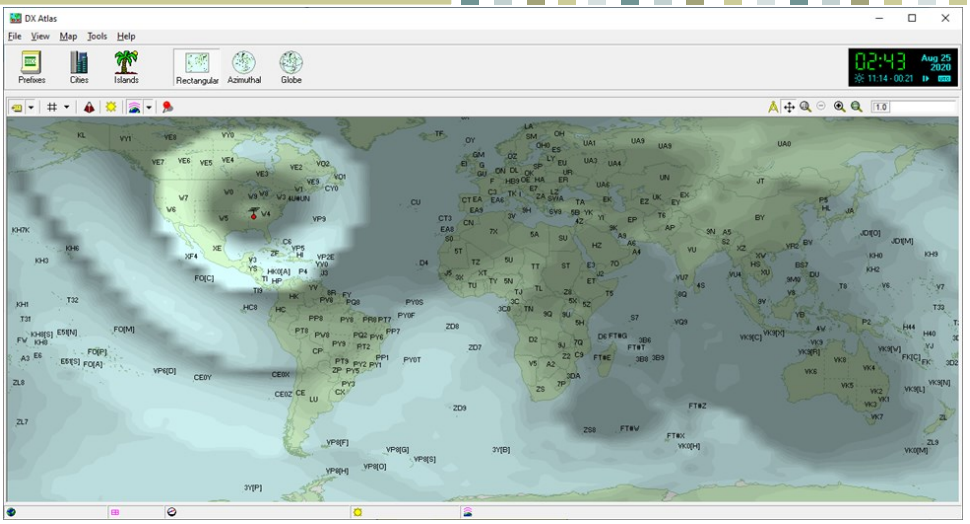
VE3NEA has an interesting site, DXatlas.com, with all kinds of software available, one of which is, of course DX Atlas, which I happen to have here. This is a software map and it costs $25. It is highly interactive: choose the projection, find the location of an entity, graph the gray line, or even sync it with the VOACAP propagation predictions.

Cont'd on p. 13

Geography for DXers

(cont'd from p. 12)

Geochron has been around for a number of years as a mechanical clock. It was highly complex and expensive, but it was a beautiful work of art. Today it also exists as a software clock that is aimed a 4k projections. The colors are deep and breathtaking. It is also highly adaptable to show the projection you want. The software version of Geochron shown below costs $449.



DXAtlas MUF Map

Software Geochron

The Casual DXer

By Kevin Hibbs, KG4TEI

Greetings fellow DXers. This month I have continued toward my DXCC goals. I managed to get the antenna back in the air again and now have 104 confirmed for DXCC digital, 102 confirmed for DXCC 20m, and 90 confirmed for DXCC 17m. I'm hoping to get the last 10 on 17m before the end of the year.

As I write this article I thought I would share some of the tools that I have been using to help make chasing DX on FT8 a little easier. The digital modes associated with WSJT-X require having the computer nearly perfectly time synced. I tried using the internal Windows clock but, I almost always had to change it on reboot or even in the middle of the day due to clock drift. I found the perfect **free** solution, a program called Net Time (https://www.timesynctool.com/). This program runs as a service in the background of Windows and can be accessed via an icon in the notification area on the status bar. This program keeps the computer's time set to within a tenth of a second and I have yet to adjust anything after I installed it. No more drift!

Another good program to use is JTAlert (hamapps.com). I'm sure many people reading this already use this program, but some may not be taking full advantage of its capabilities. WSJT-X will let you know if you have worked a country before, but it won't tell you if they have been confirmed or not. JTAlert lets the user define call

Cont'd on p. 14

DX Contests for September

By Chuck Lewis, N4NM

Worked All Europe (WAE) DX Contest (SSB) 80 -10M

Sept 12, 0000Z to Sept 13, 2359Z

Exchange: RST plus Serial No.

See page 71, Sept. QST and www.darc.de/referate

Russian RTTY WW Contest (DIG), 80-10M

Sept. 12, 0000Z to Sept. 12, 2359Z

Exchange: RST, Oblast, or CQ zone

See page 71, Sept. QST and www.qrz.ru/contest/detail/93

Scandinavian Activity Contest, (CW), 80 – 10M

Sept. 19, 1200Z to Sept, 20 1200Z

Exchange: RST plus Serial #

See page 71, Sept. QST and www.sactest.net/blog/rules

All Africa International DX Contest, (CW, SSB, Dig.), 160 – 10M

Sept. 19, 1200Z to Sept. 2, 1200Z

Exchange: RS(T) plus Serial #

See page 71, Sept. QST and www.sarl.org.za

CQ WW RTTY Contest, (DIG), 80 – 10M

Sept 25, 0000Z to Sept 27, 2359Z

Exchange: RST, State/Province, and CQ zone; DX sends RST and CQ zone

See page 71, Sept. QST and www.cqwwrtty.com

OTHERS:

Don't forget the Alabama QSO Party , Sept. 12 1500Z to Sept. 13 0300Z!

Dates & times often change or are misprinted in the journals. Beware.

Chuck, N4NM

The Casual DXer

(cont'd from p. 13)

signs or entities still needed. When I get a new contact confirmed, I update the JTAlert software, and when that entity appears again it is highlighted differently than if I still needed it. JTAlert also lets the user know if a desired call sign uses LOTW or EQSL. This can save time and effort if you want a strictly digital QSL. There are many more features, including the ability to chat with other users and sound notifications. I consider this program a must have to be effective at chasing DX with WSJT-X.

The last program, though maybe not as useful, definitely has a coolness factor. GridTracker (https://tagloomis.com/) displays information from WSJT-X on a map. This is great for doing demonstrations so that others can see the conversations taking place in real time. It also lets the user visualize their contacts with different overlays for things like DXCC, WAS, WAC, and WAZ. There is an interface with PSK-Reporter and a chat capability included.

Is there a program you are using with WSJT-X? Please let me know. I'm always interested in trying new software aids that can make putting contacts into the log easier. I hope to see you all at the meeting Tuesday.

73,
Kevin
KG4TEI

August Meeting Minutes

By Chris Reed, AI4U

Bob K8KI called the virtual meeting of the North Alabama DX Club to order on the 147.300 repeater and Zoom on Tuesday August 11, 2020 at 7pm. Bob, K8KI welcomed everyone. The main order of business was the final approval of the changes to the constitution. Tom, KG4CUY updated those in the meeting on the changes that will be in effect once approved. The summary of the changes was published in the August LongPath. The motion to approve was made and seconded. A virtual vote was held and it passed unanimously. Bob, K8KI made a few more announcements, then meeting was adjourned for the program. Bruce, AC4G presented the program "Impedance matching with transmission lines". The next virtual meeting is scheduled for 7 p.m. Tuesday, September 8th on the 147.300 repeater and Zoom. Information will be sent prior to the meeting.